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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,145	12/28/2001	Jung Il Kim	0465-0882P-SP	5232

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EXAMINER	
QI, ZHI QIANG	
ART UNIT	**PAPER NUMBER**
2871	

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/029,145	KIM ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 14-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/29/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on Jan. 8, 2004 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,433,842 (Kaneko et al) and US 6,310,674 (Suzuki et al).

Claim 1, AAPA discloses (paragraphs 0005 – 0026; Figs.1-2) an LCD device comprising:

- substrate (1);
- TFT having gate electrode (2a) and source (6)/drain (7) electrodes on the substrate (1);

- passivation film (8) formed on an entire surface of the substrate (1) and having contact hole (8a) in the drain electrode (7) of the TFT;
- pixel electrode (9a) connected to the drain electrode (7) thought the contact hole (8a), and Fig.2 shows the drain electrode (7) having a single-layer structure.

AAPA does not disclose the pixel electrode made of an amorphous transparent conductive film for preventing a generation of a galvanic effect.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (such as the drain electrode under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. Even though Kaneko discloses that the amorphous ITO is used in case of a layered structure for the drain lines, but Kaneko discloses the function of the amorphous ITO and the property of the amorphous ITO, and Kaneko indicates (col.5, lines 47-51) the amorphous ITO or IZO is preferably used as the material of the pixel electrodes so that the aluminum alloy is prevented from being damaged during etching of the pixel electrode. According to the making process, the material of the drain electrodes is aluminum or aluminum alloy. Kaneko also indicates (col.5, lines 59-61) that alternately, the drain lines may be composed of a single layer. That means in case of using single layer structure for the drain electrode, the material of amorphous ITO also can be used for the pixel electrode.

Furthermore, Suzuki discloses (col.4, lines 43 – 65) that as a display electrode, the material preferably is the ITO comprises amorphous component to improve surface smoothness, and as a result, damage to underlying layers can be alleviated, so as to enhance the display performances.

Since the same material of the amorphous ITO or IZO having same property, so that the amorphous ITO pixel electrode must have the same function such as for preventing a generation of a galvanic effect, and the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes as display electrode.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a pixel electrode made of an amorphous transparent conductive film as claimed in claim 1 for use of a weak-acid etchant so that the electrodes under the pixel electrode such as aluminum alloy is prevented from being damaged such as erosion during etching of the pixel electrodes and improving the pixel electrode contacting the electrode underneath.

Claim 8, AAPA discloses (paragraphs 0005 – 0026; Figs.1-2) that a pad structure of an LCD device comprising:

- substrate (1);
- gate electrode (2a) made from metal such as Al, Cr, or Al alloy (metal film) and gate pad (2b) made from metal such as Cu or Ti is formed on the

substrate (1), and the gate pad (2b) or the data pad (2c) (metal film) is formed of the same material as the gate line or data line;

- pixel electrode (9a) formed on the metal film, such as formed on the gate electrode (2a) or drain electrode (7).

AAPA does not expressly discloses an amorphous transparent conductive film formed on the metal film for preventing a generation of a galvanic effect.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the metal film as a pad that is the pad of electrode or for the gate line or data line, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly, and then the metal film such as the pad is prevented from corrosion or damage.

Furthermore, Suzuki discloses (col.4, lines 43 – 65) that as a display electrode, the material preferably is the ITO comprises amorphous component to improve surface smoothness, and as a result, damage to underlying layers can be alleviated, so as to enhance the display performances.

Since the same material of the amorphous ITO or IZO having same property, so that the amorphous ITO pixel electrode must have the same function such as for

preventing a generation of a galvanic effect, and the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes as display electrode.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use an amorphous transparent conductive film formed on the metal film such as a gate pad as claimed in claim 8 for use of a weak-acid etchant so that the metal pad under the amorphous transparent conductive film such as aluminum alloy is prevented from being damaged and improving the contacting for the metal pad underneath.

Claim 17, AAPA discloses (paragraphs 0005 – 0026; Figs.1-2) that a method for manufacturing an LCD device comprising:

- forming a gate line (100) including a gate electrode (2a) and gate pad (2b) on a lower substrate (1);
- forming a gate insulating film (3) on the entire surface of the substrate (1);
- forming a semiconductor film (4) above the gate electrode (2a);
- forming a data line (200) including a data pad (2c) to form source and drain electrodes (6,7) of a TFT at both sides above the semiconductor film (4);
- forming a passivation film (8) on the entire surface of the substrate (1);
- forming contact holes (such as 8a, 8b) in the drain electrode (7), the gate pad (2b) and the data pad (2c) of the TFT;

- forming transparent conductive film such as ITO film, in each pixel region, such as 9a, 9b, connected to the drain electrode (7), the gate pad (2b) and the data pad (2c) through contact holes (such as 8a, 8b);
- Fig.2 shows the drain electrode (7) having a single-layer structure.

AAPA doe not expressly discloses forming amorphous transparent conductive film in each pixel region for preventing a generation of a galvanic effect .

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the gate pad and the data pad made from metal, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly, and then the metal film such as the gate and the data pad are prevented from corrosion or damage.

Furthermore, Suzuki discloses (col.4, lines 43 – 65) that as a display electrode, the material preferably is the ITO comprises amorphous component to improve surface smoothness, and as a result, damage to underlying layers can be alleviated, so as to enhance the display performances.

Since the same material of the amorphous ITO or IZO having same property, so that the amorphous ITO pixel electrode must have the same function such as for

preventing a generation of a galvanic effect, and the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes as display electrode.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to form an amorphous transparent conductive film used as the pixel electrode in each pixel region as claimed in claim 17 for use of a weak-acid etchant so that the electrodes under the pixel electrode such as aluminum alloy or the metal gate pad and data pad are prevented from being damaged such as erosion during etching of the pixel electrodes and improving the contacting for metal gate pad and data pad underneath.

3. Claims 2-5, 9-12, 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA, Kaneko and Suzuki as applied to claims 1, 8 and 17 above, and further in view of US 5,135,581 (Tran et al).

Claims 2-5, 9-12, 18-22, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the electrodes under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes.

The lacking is the limitation such that the ITO added H_2 or H_2O and forming at a predetermined temperature.

However, Tran discloses (col.2, line 20 – col.3, line 5) that a process for forming a light transmissive electrically conductive composition at a temperature from 20°C to 300°C and sputtering occurs in a gaseous mixture comprising a sputtering gas and a stabilizing gas such as H_2 or H_2O. The pixel electrode made from amorphous ITO or IZO also is a light transmissive conductive composition. Tran indicates (col.2, line 20 – col.3, line 5) that such forming process at the temperature from 20°C to 300°C and containing such stabilizing gas H_2 or H_2O advantageously reduces the visible light absorption and renders more stable. Based on the prior art disclosed the temperature range, the skilled in the art would perform a suitable temperature range such as 150°C to 350°C, and that would have been at least obvious (see MPEP 2144.05, "overlap ranges disclosed by the prior art" a prima facie case of obviousness exists).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use amorphous ITO or amorphous IZO forming the pixel electrode at a predetermined temperature and adding H_2 or H_2O as claimed in claims 2-5, 9-12 and 18-22 for reducing the visible light absorption and achieving more stable characteristics.

4. Claims 6-7,14-16 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA, Kaneko and Suzuki as applied to claims 1, 8 and 17 above, and further in view of US 2001/0029054 (Maeda et al).

Claims 6, 15 and 23, the lacking limitation is such that the thickness of the pixel electrode (amorphous transparent conductive film) is about 500 Å to 2000 Å.

However, Maeda discloses (paragraphs 0100 – 0105) that the thickness of the transparent conductive thin film (such as the amorphous ITO film to form the pixel electrode) is preferably 50 to 200 nm (500 Å to 2000 Å) to prevent coloring caused by interference.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to form the pixel electrode as claimed in claim 6, 15 and 22 for preventing the coloring cause by interference.

Claims 7, 16 and 24, AAPA discloses (paragraph 0026) that the pixel electrodes also can be formed of polycrystal ITO and having a thickness of 500 Å.

Claim 14, AAPA discloses (Fig.2) that the metal film such as the drain electrode (7) or the gate pad (2b) has a single-layer structure.

Response to Arguments

5. Applicant's arguments filed on Nov.10, 2003 have been fully considered but they are not persuasive.

Applicant's arguments are as follows:

1) The reference Kaneko does not disclose the use of amorphous ITO as the pixel electrode when a drain electrode has a single-layer structure.

2) The reference Kaneko does not disclose forming an amorphous ITO on a metal film functioning as a pad for the LCD device and for preventing a generation of a galvanic effect.

Examiner's responses to the Applicant's **only** arguments as follows:

1) Kaneko is a secondary reference that discloses the function of the amorphous ITO and the property of the amorphous ITO, and Kaneko indicates (col.5, lines 47-51) the amorphous ITO or IZO is preferably used as the material of the pixel electrodes so that the aluminum alloy is prevented from being damaged during etching of the pixel electrode. According to the making process, the material of the drain electrodes is aluminum or aluminum alloy. Kaneko also indicates (col.5, lines 59-61) that alternately, the drain lines may be composed of a single layer, so that in case of the drain electrode has a single-layer structure, the amorphous ITO material also can be used for the pixel electrode. Because the amorphous ITO or IZO having such property, the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode when a drain electrode has a single-layer structure and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes.

2) Kaneko is a secondary reference that discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (the material of the electrodes is aluminum or aluminum alloy under the pixel electrode) is prevented from being damaged during etching of the pixel electrodes. As the same principle, the gate pad and the data pad made from metal, to prevent the metal film from damage also can use amorphous transparent conductive film formed on the metal film. Because the property of the amorphous transparent conductive film is etched by weak acid easily and rapidly,

and then the metal film such as the gate and the data pad are prevented from corrosion or damage. Since the same material of the amorphous ITO or IZO having same property, so that the amorphous ITO pixel electrode must have the same function such as for preventing a generation of a galvanic effect, and the skilled in the art would be able to use the advantage of the property of the amorphous ITO or IZO to form the pixel electrode and preventing the contact failure with the drain electrode and protecting the drain electrode during etching for forming the pixel electrodes as display electrode.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Qi
March 16, 2004

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